CLAIMS

1. A system for estimating quantities of pollutant compounds emitted in the exhaust gases of a diesel engine of a motor vehicle, comprising means for regenerating a solid particulate filter, an electronic control unit for managing the engine operation comprising data memories, characterized in that it comprises:

- one or more neural networks (1);
- input data (2) representative of the engine operation and, optionally, of the vehicle movement, said data (2) being available in the electronic control unit for managing the engine operation without adding a sensor; and
- means (4) for cumulating the estimated quantities (3).

2. The system as claimed in claim 1, characterized in that it comprises 10 to 15 neurons.

3. The system as claimed in either of claims 1 and 2, characterized in that it comprises training databases of the neural network or networks (1) said databases being vehicle drive sequences of at least a few minutes.

4. The system as claimed in any one of claims 1 to 3, characterized in that the data used at the input of the neural network or networks (1) comprise at least one of the following parameters:

- the engine speed (7) at two consecutive times t and $t-\Delta t$;
- the fuel flow rate (8) at three consecutive times t, $t-\Delta t$ and $t-2\Delta t$;
- the engine coolant (9) temperature; and
- the vehicle speed (10) at time t;

where Δt is the preset time interval between two

consecutive measurement times and characterized in that it comprises means for estimating at least the cumulative quantity (16) of the soot in the exhaust gases which will be retained by the particulate filter.

5. The system as claimed in any one of claims 1 to 4, characterized in that the data used at the input of the neural network or networks (1) comprise at least one of the following parameters:

- the engine speed (7) at two consecutive times t and $t-\Delta t$;
- the fuel flow rate (8) at three consecutive times t, $t-\Delta t$ and $t-2\Delta t$;
- the engine coolant (9) temperature; and
- the fuel-air ratio (18) of the mixture at time t;

where Δt is the preset time interval between two consecutive measurement times and characterized in that it comprises means (15) for estimating at least the cumulative quantity (16) of the soot in the exhaust gases which will be retained by a particulate filter.

6. The system as claimed in any one of claims 1 to 5, adapted to an engine with common rail injection, characterized in that the data used at the input of the neural network or networks (1) at time t comprise at least one of the following parameters:

- the fuel preinjection rate (19) in the engine;
- the main (2) fuel injection rate in the engine;
- the relative displacement (21) of a piston with respect to top dead center from the time when the last fuel injection in the piston cylinder started;
- the relative displacement (22) of a piston with respect to top dead center from the time when the last main fuel injection in the piston cylinder started;
- the engine coolant temperature (9);
- the engine air feed rate (23);

- the pressure (24) inside the common rail; and
- the engine speed (7);

and in that the estimated quantities of pollutant compounds comprise at least one of the following quantities:

- the cumulative quantity (16) of the soot in the exhaust gases that will be retained by a particulate filter;
- the cumulative quantity (35) of nitrogen oxides in the exhaust gases;
- the cumulative quantity (31) of the carbon oxides in the exhaust gases; and
- the cumulative quantity (27) of hydrocarbons in the exhaust gases.

7. The system as claimed in any one of claims 1 to 6, characterized in that no output (3,5) from the system is looped to an input (2) of the system to avoid any problem of stability.

8. The system as claimed in any one of claims 1 to 7, characterized in that it comprises means for resetting the estimated quantities of particulates, independently of each other.

9. A method for evaluating a system implementing any one of claims 1 to 8, characterized in that it evaluates the best configuration of the neural network or networks (1) by calculating the error on the output quantities (3) by cumulation on a sliding window.

10. The method as claimed in claim 9, characterized in that the sliding window is determined so that its size is minimal while allowing an estimation error lower than a preset value.

11. The method as claimed in claim 10, characterized in that the size of the window

corresponding to a vehicle movement varies between 0.5 km and 1.5 km to allow an estimation error of not more than 5 g of solid particulates emitted per 135 km traveled by the vehicle.

12. The method as claimed in any one of claims 9 to 11, characterized in that part of the data reserved for training the neural network or networks (1) is discarded to perform a validation without the data used.

13. The application of the system as defined in either of claims 6 and 7, to control the means for regenerating the solid particulate filter using a comparison between the estimated quantity of cumulative soot (16) and a memorized threshold value.

14. The application of the system as defined in claim 8, to aid the calibration of engine control strategies from the estimation of the engine emissions over a vehicle drive cycle.